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Case Docket No. **AAI-002**

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09/08/00COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

Transmitted herewith for filing is the patent application of

Inventor(s): **Kevin E. Mahaffy, David B. Mahaffy and Eric E. Schmidt**For: **A POINT-OF-SALE COMMERCIAL TRANSACTION PROCESSING SYSTEM USING ARTIFICIAL INTELLIGENCE ASSISTED BY HUMAN INTERVENTION**

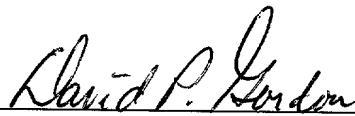
Enclosed are:

- |   |  |
|---|--|
| 3 | Sheets of drawings   |
| 2 | Assignment Recordation Sheets  |
| 2 | Assignments of Invention to: <b>agentAI, Inc.</b>                        |
| 3 | Statements to establish small entity status under 37 C.F.R. 1.9 and 1.27 |
| 2 | Declaration and Power of Attorney documents                              |
|   | Preliminary Amendment and Remarks  |
|   | Other:   |

The filing fee has been calculated as shown below:

			SMALL ENTITY		OR	LARGE ENTITY	
FOR	NO. FILED	NO. EXTRA	RATE	FEE		RATE	FEE
BASIC FEE				\$ 345			\$ 690
TOTAL CLAIMS	30-20	10	X 9	90		X 18	
INDEP CLAIMS	2 - 3	0	X 39			X 78	
MULT. DEPENDENT CLAIMS PRESENTED			+130			+260	
			TOTAL \$ 435			TOTAL \$	

- ☒ A check in the amount of **\$ 515.00** to cover the filing/assignment recordation fee is enclosed.
- ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_.  
A duplicate copy of this sheet is enclosed.
- ☒ The Commissioner is hereby authorized to charge any additional filing fees required under 37 CFR 1.16 associated with this communication or credit any overpayment to Deposit Account No. **07-1732**. A duplicate copy of this sheet is enclosed.
- ☐ Other:

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 David P. Gordon  
 Reg. No. 29,996

Docket No. AAI-002

**STATEMENT CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR**

As a below named inventor, I hereby state that I am an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41 (a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:

**A POINT-OF-SALE COMMERCIAL TRANSACTION PROCESSING SYSTEM USING  
ARTIFICIAL INTELLIGENCE ASSISTED BY HUMAN INTERVENTION**

described in ☒ the specification filed herewith  
☐ application serial No. , filed  
☐ patent No. , issued

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey or license any rights in the invention is listed below:

☐ no such person, concern, or organization  
☒ persons, concerns or organizations listed below\*

\*Note: Separate statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME: agentAI, Inc.  
 ADDRESS: 863 E. Country View Circle  
Fresno, CA 93720

☐ Individual ☒ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby state that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this statement is directed.

NAME OF INVENTOR Kevin E. Mahaffy

SIGNATURE Kevin E. Mahaffy

DATE 6 SEP 2000

NAME OF INVENTOR Eric E. Schmidt

SIGNATURE E. Schmidt

DATE 6 SEP 00

000000-AT-25960

Docket No. AAI-002

**STATEMENT CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) and 1.27(c) - SMALL BUSINESS CONCERN**

I hereby state that I am     ☐ the owner of the small business concern identified below  
    ☒ an official of the small business concern empowered to act on behalf of the  
 concern identified below:

NAME OF CONCERN: agentAL, Inc.  
ADDRESS OF CONCERN: 863 E. Country View Circle  
Fresno, CA 93720

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9 (d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled: **A POINT-OF-SALE COMMERCIAL TRANSACTION PROCESSING SYSTEM USING ARTIFICIAL INTELLIGENCE ASSISTED BY HUMAN INTERVENTION**

by inventor(s): **Kevin E. Mahaffy, David B. Mahaffy and Eric E. Schmidt**  
described in ☒ the specification filed herewith  
☐ application serial No. \_\_\_\_\_, filed \_\_\_\_\_  
☐ patent No. \_\_\_\_\_, issued \_\_\_\_\_

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below\* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

\*Note: Separate statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

**NAME:**  
**ADDRESS:**

☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby state that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this statement is directed.

NAME OF PERSON SIGNING: Kevin E. Mahaffy  
TITLE IN ORGANIZATION: President  
ADDRESS OF PERSON SIGNING: 897 E. Country View Circle, Fresno, CA 93720

SIGNATURE: Kevin E. Mahaffy DATE: 6 SEP 2000

Docket No. AAI-002

STATEMENT CLAIMING SMALL ENTITY  
STATUS (37 CFR 1.9(f) and 1.27(b)) - **INDEPENDENT INVENTOR**

As a below named inventor, I hereby state that I am an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41 (a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention **entitled:**

# A POINT-OF-SALE COMMERCIAL TRANSACTION PROCESSING SYSTEM USING ARTIFICIAL INTELLIGENCE ASSISTED BY HUMAN INTERVENTION

described in           [X] the specification filed herewith  
[ ] application serial No.                                 , filed  
[ ] patent No.   , issued

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey or license any rights in the invention is listed below:

☐ no such person, concern, or organization  
☒ persons, concerns or organizations listed below\*

\*Note: Separate statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME: agentAI, Inc.  
ADDRESS: 863 E. Country View Circle  
Fresno, CA 93720

☐ Individual ☒ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby state that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this statement is directed.

NAME OF INVENTOR David B. Mahaffy

**SIGNATURE**

DATE \_\_\_\_\_

9/7/00

1 A POINT-OF-SALE COMMERCIAL TRANSACTION PROCESSING SYSTEM USING  
2 ARTIFICIAL INTELLIGENCE ASSISTED BY HUMAN INTERVENTION

3  
4 BACKGROUND OF THE INVENTION

5  
6 1. Field of the Invention

7 This invention relates broadly to data processing systems for  
8 commercial transactions. More particularly, this invention  
9 relates to point-of-sale (POS) registers and systems for  
10 communicating therewith to facilitate and expedite the ordering  
11 and purchase of food items from a restaurant. Notably, the  
12 invention utilizes artificial intelligence to at least partially  
13 process transactions, and relies on human intervention where the  
14 artificial intelligence is unable to complete the transactions.

15  
16 2. State of the Art

17 The concept behind a fast food restaurant is the ability to  
18 rapidly fulfill food orders placed by a customer at the  
19 restaurant's order placement counter. In the current fast food  
20 operation model, a plurality of point-of-sale (POS) registers are  
21 located on the counter, and the registers are each operated by a  
22 cashier behind the counter to enter a customer's order into the  
23 register, for example via a keypad. The order is then  
24 communicated, for example orally by the cashier, by printed  
25 instructions, or by video display, to employees who prepare and

1 assemble the customer's order. In addition, the purchase price of  
2 the order is totalled and the customer provides payment to the  
3 cashier. Finally, the order is delivered to the customer, either  
4 at the register or in an order pick-up queue.

5  
6 The primary bottleneck to serving greater numbers of  
7 customers is in the processing of the orders (i.e., order taken,  
8 payment transaction, and order delivery). Research indicates that  
9 profits for a fast food restaurant can be increased by decreasing  
10 the transaction time for the orders, such that more orders can be  
11 entered in a given time frame. However, using the order system  
12 presently in place, order process time has been substantially  
13 optimized. Training techniques for cashiers have been refined  
14 over the years to arrive at the current techniques. While  
15 one manner of increasing the ability to process orders would be to  
16 provide additional point-of-sale registers on the order counter  
17 and cashiers to operate the registers, counter space is limited.  
18 Indeed, fast food restaurants are designed to provide a market  
19 researched optimum split between order processing space (customer  
20 waiting area and order counter, order fulfillment space (kitchen  
21 and order preparation), and dining space. It would not be  
22 desirable to disrupt the allocation of space within a fast food  
23 restaurant.

A number of systems have been proposed and even attempted in trials which are purported to increase order processing. For example, U.S. Patent No. 5,235,509 to Mueller et al. discloses a customer self-order system which displays menu items on a touch screen and steps the customer through ordering from various food categories: burgers, fries, salads, drinks, desserts, etc. U.S. Patent No. 5,845,263 to Camaisa et al. discloses an interactive visual order system which provides information in addition to menu items and price to the customer. For example, the customer can obtain information relating to method of preparation and nutritional content, thereby allowing the customer to make a more informed decision. None of these systems or other alternatives has gained acceptance. It is believed that the failure of the proposed systems all have a common drawback. In a fast food environment, where lines of customers are frequently encountered, some customers may be intimidated or confused by the unfamiliar systems and require employee assistance, which slows down the entire system. An additional drawback to the proposed systems is their inability to effectively promote sales with the degree of success provided by a human cashier. Customers all know the ubiquitous phrase "do you want fries with your order". The phrase is used so commonly because it effectively increases sales. In addition, the current trend to move customers to an 'upsized' order of french fries or soft drink also substantially increases the sales at a restaurant, and any new system must be able to

1 provide such promotional features as effectively as a human  
2 cashier. Otherwise, the systems will not gain favor by the  
3 restaurant operators and will not be utilized.

4  
5 SUMMARY OF THE INVENTION  
6

7 It is therefore an object of the invention to provide a  
8 system which can process a great number of fast food orders.  
9

10 It is another object of the invention to provide an order  
11 system which provides a familiar order experience to the customer.  
12

13 It is a further object of the invention to provide a fast  
14 food ordering system which optimizes the use of order processing  
15 space in a fast food restaurant.  
16

17 It is an additional object of the invention to provide a fast  
18 food ordering system in which the numbers of behind-the-counter  
19 cashiers may be reduced or even eliminated, thereby providing  
20 additional room for order fulfillment such that additional orders  
21 may be processed.  
22

23 Another object of the invention is to provide a fast food  
24 ordering system which does not require customer 'training' and



1 provides a relatively seamless experience for the customer  
2 relative to conventional fast food ordering.

3  
4 A further object of the invention is to provide a fast food  
5 ordering system which effectively promotes products in a manner to  
6 increase sales for the restaurant.

7  
8 It is yet another object of the invention to provide a point-  
9 of-sale commercial transaction processing system which is  
10 adaptable for use in a variety of commercial industries and  
11 establishments.

12  
13 In accord with these objects, which will be discussed in  
14 detail below, a point-of-sale commercial transaction processing  
15 system, particularly suitable for the fast food industry, is  
16 provided. The transaction processing system utilizes (1) a  
17 customer interaction terminal (CIT) having a video display, an  
18 audio speaker, a microphone, and preferably a printer, (2) a  
19 computer system coupled or integral with the customer interaction  
20 terminal (CIT) and running artificial intelligence routines to  
21 process or pre-process verbal requests provided into the  
22 microphone of the customer interaction terminal, and (3) a human-  
23 controlled response system which completes, corrects or verifies  
24 requests that cannot be satisfactorily completed by the artificial  
25 intelligence routines alone. The human-controlled response system

1 is preferably in communication with the customer interaction  
2 terminal (CIT) (and the customer) via a high speed voice over  
3 internet protocol (VoIP) or data connection.

4  
5 According to a preferred embodiment of the invention, the  
6 computer system presents on the customer interaction terminal  
7 (CIT) a graphic image of a virtual cashier which is programmed to  
8 interact graphically and through audio with the customer in a  
9 manner to which the customer is accustomed from prior experience  
10 with human cashiers in conventional fast food restaurants. That  
11 is, the virtual cashier preferably includes an image of a face of  
12 cashier which auditorily greets, engages, and prompts the customer  
13 to verbally provide the fast food order to the virtual cashier  
14 (Hello. Please tell me your order.). The customers verbal orders  
15 are received by the microphone of the CIT and transmitted to the  
16 computer system where they are processed. As the virtual cashier  
17 image is computer generated, the face and other features of the  
18 cashier may be human-like or whimsical, and may even be  
19 representative of a mascot of the restaurant.

20  
21 The artificial intelligence routines of the computer system  
22 are preferably adapted to process the verbal orders such that a  
23 complete fast food order (menu item selection, special preparation  
24 requests, eat in or take out, etc.) can be processed. The  
25 complete order may require multiple interactions between the

1 customer and virtual cashier; i.e., after the customer orders a  
2 sandwich, the virtual cashier can engage the customer and ask  
3 whether the customer would like a soft drink and, if so, which  
4 size. Furthermore, according to a preferred aspect of the  
5 invention, the routines in the computer system which operate the  
6 virtual cashier are adapted to follow techniques which are shown  
7 to increase restaurant sales. For example, the virtual cashier  
8 can ask whether the customer would like french fries with an  
9 order, or whether for a nominal additional sum the customer would  
10 prefer to upsize the french fries and drink order. In addition,  
11 the virtual cashier can promote special offers and provide  
12 advertisements.

13  
14 It is recognized that current state of the art artificial  
15 intelligence alone may not be sufficient to satisfactorily  
16 complete all fast food orders. As such, according to a preferred  
17 aspect of the invention, when the computer system is unable to  
18 satisfactorily complete a fast food order via the human customer-  
19 artificial intelligence virtual cashier interaction, or at any  
20 time upon customer request, a human-controlled response system,  
21 preferably located off-site of the CIT, is employed to complete,  
22 correct or verify the order by interaction with the customer via  
23 the CIT. The interaction of the human-controlled response system  
24 is through the graphics and audio of the CIT and is preferably  
25 indistinguishable to the customer relative to interaction with the

1 artificial intelligence routines. That is, the customer is  
2 preferably unaware of any shortcoming in the AI processing and  
3 perceives the order interaction as one continuous interaction even  
4 if the response system is utilized within an order. The  
5 availability of human intervention permits the use of artificial  
6 intelligence even as the state of the art artificial intelligence  
7 may not yet be ripe for use in all fast food order transactions.

8  
9 Once an order has been completely processed, payment may be  
10 made at the CIT, using a debit or credit card or cash, and the  
11 order is sent to order fulfillment employees who prepare the  
12 order. The customer is also directed to a pick-up location and  
13 may be given an order number corresponding to his or her order.

14  
15 It will be recognized that the above described system  
16 eliminates the need and space required for traditional human  
17 cashiers and, therefore, a greater amount of the order processing  
18 space may be devoted to CITs. In addition, CITs may be placed on  
19 tables, on walls, at kiosks, at drive-through locations, in  
20 portable devices, and at other locations. Furthermore, as the  
21 CITs preferably display a face and provide a spoken dialogue with  
22 the customer, the customer does not require any particular  
23 training to use the system; i.e., use of the system of the  
24 invention provides a substantially seamless experience, in terms  
25 of ordering, from conventional fast food ordering experiences.

1 The customer interacts in the same manner as he or she has  
2 previously with human cashiers. Moreover, the system, while easy  
3 to use for the customer, provides substantial novelty which  
4 attracts and retains customers.

5  
6 Additional objects and advantages of the invention will  
7 become apparent to those skilled in the art upon reference to the  
8 detailed description taken in conjunction with the provided  
9 figures.

10  
11 BRIEF DESCRIPTION OF THE DRAWINGS  
12

13 Fig. 1 is a schematic diagram of a point-of-sale commercial  
14 transaction processing system according to the invention;  
15

16 Fig. 2 is a flow chart of a first embodiment of implementing  
17 the point-of-sale commercial transaction processing system of the  
18 invention; and  
19

20 Fig. 3 is a flow chart of a second embodiment of implementing  
21 the point-of-sale commercial transaction processing system of the  
22 invention.  
23

## 1 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

2  
3 Turning now to Fig. 1, a point-of-sale commercial transaction  
4 processing system 10 particularly suited for a fast food  
5 establishment is provided. The transaction processing system  
6 includes a customer interaction terminal (CIT) 12, a computer  
7 system 14 coupled to the CIT, and a human-controlled response  
8 system 16 in communication with the computer system 14.

9  
10 The CIT 12 includes a video display 20, an audio speaker 22,  
11 a microphone 24, and optionally a video camera 26. In addition,  
12 the CIT 12 also preferably includes a printer 28, a debit/credit  
13 card reader 30, and a bill and/or coin currency reader 32 as well  
14 as a change dispenser 34. The CIT may also include an activation  
15 button 36, such as a 'push-to-talk' button, and may further  
16 include a sensor 37, e.g., an infrared or sonic sensor, which  
17 senses when a customer is located in an "ordering" position  
18 relative to the CIT. As an optional alternative, the video camera  
19 26 may function as the sensor. The CIT 12 is located in a fast  
20 food restaurant. The CIT 12 may be placed on a counter, in a  
21 kiosk, on a wall, at a dining table, along a take-out drive-  
22 through route, in a portable device which may be transported along  
23 a drive-through route, or in any other suitable location within or  
24 relative to a fast food restaurant enabling customer interaction  
25 with the CIT.

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1       The computer system 14 is coupled to or integral with one or  
2 more CITs and is adapted to receive input from the CITs 12 (via  
3 the microphone 24 and optional video camera 26) and provide output  
4 to the display 20, audio speaker 22, and printer 28 of the CIT.  
5 That is, the CIT 12 is under the control of the computer system  
6 14. In addition, the computer system 14 preferably includes a  
7 memory adapted to record the audio and optionally the video  
8 portion of a current interaction between a customer and a CIT.  
9 While multiple CITs 12 may be coupled to a single computer system  
10 14 (two CITs 12 being shown in solid lines in Fig. 1), for  
11 clarity, the invention will be described with respect to a single  
12 CIT 12 being coupled to the computer system 14. The computer  
13 system 14 has software adapted to permit each CIT 12 to 'interact'  
14 with a customer and process (via artificial intelligence routines)  
15 customer orders spoken into the microphone 22, as described in  
16 more detail below, and a microprocessor adapted to run the  
17 software.

18  
19       The human-controlled response system, e.g., a call center 16,  
20 is connected to the computer system 14 (or multiple computer  
21 systems 14, each, in turn, coupled to one or more CITs 12). The  
22 call center 16 is preferably located on different premises than  
23 the CIT 12 and computer system 14, and more preferably located in  
24 a country or region having a relatively lower labor cost than the  
25 country or region in which the CIT is located. A number of human

1 operators 40 work at the call center, and each operator is  
2 provided with an audio speaker 42, a microphone 44, and a display  
3 46. The audio speaker 42 is adapted to reproduce for the operator  
4 40 sounds (words) spoken into the microphone 24 of the CIT and/or  
5 recorded by the computer system 14, the microphone 44 is adapted  
6 to permit the operator to provide spoken messages to the customer  
7 via the speaker 22 of the CIT, and the display 46 permits the  
8 operator to see the customer's order, and preferably displays the  
9 same images shown on the display 20 of the CIT.

10  
11 Referring to Figs. 1 and 2, the software permitting the CIT  
12 12 to 'interact' with customers includes a graphic image of a  
13 virtual cashier 38 programmed to interact graphically and through  
14 audio via the microphone 22 and speakers 24 with the customer  
15 interfacing with the CIT 12. The images of the virtual cashier  
16 are preferably computer generated and, as such, the face and other  
17 features of the cashier may be human-like, animal-like, or  
18 whimsical in nature, and may even be representative of a mascot of  
19 the restaurant (e.g., Ronald McDonald) or characters in a movie or  
20 television show. Human-like features may be representative of  
21 celebrities. The interaction is preferably performed in a manner  
22 similar to that which the customer is accustomed from prior  
23 experience with human cashiers in conventional fast food  
24 restaurants. That is, the virtual cashier preferably displays  
25 images of a face of cashier and auditorily greets, engages, and



1 prompts at 100 the customer to verbally provide a fast food order  
2 to the virtual cashier (e.g., "Hello. Please place your order  
3 with me."). The customer's verbal orders are received by the  
4 microphone 22 of the CIT and transmitted to the computer system 14  
5 where they are processed, as described below.

6  
7 According to a preferred embodiment of the order processing  
8 software, when a customer order is verbally provided into the  
9 microphone 22 of the CIT at 102, the order is provided to the  
10 computer system 14 and the artificial intelligence routines are  
11 adapted to process at 104 the customer's order in real time. That  
12 is, the artificial intelligence (AI) routines are adapted to parse  
13 from the orders the necessary content to determine what the  
14 customer wants to order.

15  
16 The ability of the AI routines to satisfactorily process  
17 customer orders at 104 depends on the amount of variability  
18 present in the process; i.e., the extent to which the vocabulary  
19 and the grammar used in the interaction varies from one customer  
20 to another. The AI routines are preferably optimized based on  
21 conditioning data collected from conversation over a period of  
22 time (e.g., a few days) at a conventional cashier point of sale  
23 terminal and examined for recurring patterns, and then used to  
24 train the AI routines. AI routine training and optimization is  
25 preferably performed on a continual basis, with reports of

1 misunderstood communications regularly analyzed and used to  
2 improve the performance of the system.

3  
4 An important issue for automating customer interaction with  
5 the CIT is to distinguish between customer-CIT interaction speech  
6 and other speech, e.g., utterances by the customer to other people  
7 in the vicinity, or even "talking to oneself". One simple  
8 approach to overcome this difficulty is to use a push-to-talk  
9 button 36, as described in J. Gustafson, N. Lindberg, and M.  
10 Lundeberg, "The August Spoken Dialogue System", *Proceedings of*  
11 *Eurospeech '99* (1999). Another preferred approach is to use the  
12 optional video camera 26 to track the customer's head orientation  
13 and gaze (head tracking), and only respond to utterances made when  
14 the user is looking directly at the CIT. The problem of pose  
15 recognition (i.e., recognizing, from a camera image, whether a  
16 person's face is oriented towards the camera) is not very  
17 difficult. For example, standard machine learning techniques can  
18 be used. First, a training corpus of faces is constructed, with  
19 examples of faces looking at the camera and faces looking  
20 elsewhere. Second, the system is trained to learn an algorithm  
21 which distinguishes between the two. Finally, the resulting  
22 classifier is applied to new faces. Reasonable success has been  
23 achieved on the pose recognition task using neural networks. T.  
24 Mitchell, *Machine Learning*, McGraw Hill (1997). More modern  
25 classifiers, such as support vector machines can be used to

1 achieve even higher accuracy. C. Burges, "A Tutorial on Support  
2 Vector Machines for Pattern Recognition", *Data Mining and*  
3 *Knowledge Discovery*, Vol. 2, Number 2, p. 121-167 (1998). There  
4 are also approaches based on template matching which may be used.  
5 B. Scassellati, "Finding Eyes and Faces with a Foveated Vision  
6 System", *Proc. 15th National Conference on Artificial Intelligence*  
7 (AAAI-98), AAAI Press (1998).

8  
9 Tracking the customer's head orientation is user-friendly,  
10 especially in drive-through settings, where the customer would  
11 otherwise have to extend his or her hand from the car to push the  
12 button 36. However, it is also more prone to error, particularly  
13 for nonstandard facial configurations (e.g., men with a heavy  
14 beard or people wearing a baseball cap). When the head tracking  
15 approach is used, it is preferable that the CIT 12 indicate to the  
16 customer when the system interprets that the customer's spoken  
17 words are aimed at the system. Where the interaction is based on  
18 animated characters, the indicator can be entertaining. For  
19 example, if the system is not listening to the spoken words of the  
20 customer, the character can pretend to be sleeping. Then, when  
21 the customer is communicating with the system, but the system  
22 fails to recognize the communication, the manual push-to-talk  
23 button can be used as a fall-back.

24

1 Current speech recognition systems are effective in one of  
2 two modes: either there is a single speaker, for which the system  
3 can be individually trained to understand a relatively large  
4 vocabulary; or there can be multiple speakers for which current  
5 systems can recognize a limited vocabulary. For the system of the  
6 invention, the vocabulary required is likely to be quite limited,  
7 thereby making high-accuracy speech recognition feasible for use  
8 by multiple users. For example, in another application of a  
9 restricted-domain automated dialogue system, a vocabulary of 500  
10 words was sufficient. See Gustafson et al. (1999).

11  
12 Currently existing on the market are several high-quality  
13 commercial speech recognition systems: Dragon's  
14 NaturallySpeaking™, Kurzweil Applied Intelligence's L&H Voice  
15 Xpress™, and IBM's ViaVoice™. These speech recognition systems  
16 are primarily designed for single speaker, large vocabulary  
17 settings. However, the systems may be modified for use in a  
18 multiple speaker, limited vocabulary setting. Another option is  
19 to utilize a speech recognition tool kit with a developer's  
20 application programming interface (API) that allows the vocabulary  
21 and other aspects to be tailored to the fast food ordering process  
22 (See <http://www.speech.cs.cmu.edu/comp.speech/FAQ.Packages.html>  
23 for links to available packages.) In addition, an existing public  
24 domain speech recognition system may be adapted, or a system may

1 be implemented from scratch. See Gustafson et al. (1999) for  
2 details on how this can be done.

3  
4 An important issue is the ability of the AI routines of the  
5 computer system 14 to recognize when the result of the speech  
6 recognition is correct and, when it is incorrect, to cause the  
7 system to ask the customer for a clarification or cause  
8 intervention by a human operator, as described further below.  
9 Several approaches can be used for estimating this confidence.  
10 All current speech recognition systems use an underlying  
11 probabilistic model, so they can be adapted to output the  
12 probability of the acoustic signal given the recognized words. In  
13 other words, this number estimates how likely this particular word  
14 sequence is to have generated the acoustic signal heard. If this  
15 number is low, this is an indicator of possibly faulty  
16 recognition. A possible improvement to this approach is to also  
17 generate a second probability of the acoustic signal given a  
18 syllable-based recognition system that does not try to match  
19 words. See Gustafson et al. (1999). If the second probability is  
20 substantially higher than the first, then the utterance contained  
21 words outside the vocabulary of the speech recognition system's  
22 lexicon that the system "forced" into words in the lexicon.

23  
24 As the AI routines processes the words of the customer's  
25 order, the task is to recognize the customer's request at a level

1 sufficient to process his order. There are several approaches to  
2 this task, of increasing complexity on the one hand, but probably  
3 higher accuracy rates on the other. The simplest approach is to  
4 use no semantic processing, just recognition of basic menu items.  
5 In this case, the analysis is a direct result of the speech  
6 recognition. If one recognizes the words "three" and  
7 "SuperBurgers" in an utterance, this is interpreted as an order of  
8 three SuperBurgers. This approach will work for simple menu  
9 orders, but may be too limited to many cases, as it may not be  
10 able to deal with any extensions such as "without pickles", "extra  
11 mustard", etc.

12  
13 A second level is to generate a corpus of utterances that are  
14 likely to occur in a customer-CIT interaction. One can then  
15 compare the customer utterance to others in the database, and find  
16 the closest match. This is the approach discussed in Gustafson et  
17 al. (1999). A semantic interpretation, i.e., a mapping between  
18 the sentence structure and an order form, can then be manually  
19 constructed for each template sentence. The extent to which this  
20 approach can be successful depends, as discussed above, on the  
21 variability of utterances that occur.

22  
23 The next level is to actually parse the sentences using some  
24 type of grammar. There has been substantial improvement in the  
25 last five years in parsing (See C. Manning and H. Schütze,

1 *Foundations of Statistical Natural Language Processing*, MIT Press  
2 (1999)), including a recent account of parsing a large corpus of  
3 speech utterances. See E. Charniak, "The Statistical Natural  
4 Language Processing Revolution", colloquium talk given at Stanford  
5 University, April 26, 2000 (see [http://robotics.stanford.edu/ba-](http://robotics.stanford.edu/ba-colloquium/previous/spring00/abst-charniak.html)  
6 [colloquium/previous/spring00/abst-charniak.html](http://robotics.stanford.edu/ba-colloquium/previous/spring00/abst-charniak.html)). The parsing uses  
7 a grammar, preferably learned automatically from a corpus of  
8 utterances parsed manually. As discussed in L. Bell and J.  
9 Gustafson, "Interaction with an Animated Agent in a Spoken  
10 Dialogue System", *Proceedings of Eurospeech '99* (1999), the number  
11 of grammatical variations in automated dialogue systems is usually  
12 quite small, and the grammar is quite simple. Again, it is  
13 easiest to manually provide a semantic interpretation for each  
14 grammatical structure, as above.

16 A difficult problem is the treatment of anaphoric references,  
17 of the form: "actually, cancel that and give me two orders  
18 instead". It is difficult to relate the words "that" and  
19 "instead" to particular items used in previous utterances. There  
20 has been some success in automatically clarifying anaphoric  
21 references (See E. Charniak, N. Ge, and J. Hale, "A Statistical  
22 Approach to Anaphora Resolution", *Proceedings of the Sixth*  
23 *Workshop on Very Large Corpora* (1998)), but this is still a  
24 difficult problem. As such, the AI routines are preferably  
25 adapted to clarify the references by having the CIT ask the

1 customer "what do you mean?", or by causing intervention by a  
2 human operator 40, discussed below.

3  
4 If the AI routines are able to recognize and parse the speech  
5 of the customer (as preferably determined via a probabilistic  
6 calculation) such that individual menu items ordered are properly  
7 added to the customer's order list (the transaction) after each  
8 menu item is ordered, the CIT is updated at 108 (and 42 in Fig. 1)  
9 to affirm order recognition. The update preferably includes one  
10 or more of three subtasks: text generation, voice generation, and  
11 animation generation. The text is preferably displayed in a  
12 predetermined set of grammatical forms, filled in with the details  
13 of the customer's transaction. Voice generation to interact with  
14 the customer may be based on automated speech synthesis. However,  
15 given the limited number of words that the CIT would need to  
16 reproduce, it is preferable that CIT speech to a customer be  
17 provided using pre-recorded words. Known smoothing techniques are  
18 preferably used to provide a natural sounding transition between  
19 the reproduced pre-recorded words. The virtual cashier's face is  
20 animated to correspond to the words being 'spoken' by the virtual  
21 cashier. This can be done by one of two approaches. The simpler  
22 approach is a 'manual' approach in which, for human characters, a  
23 human actor prerecords all the words which may need to be spoken  
24 and, using standard morphing techniques, the transitions between  
25 words are smoothed. For cartoon characters, each word can be



1 animated and the same morphing technique can be used for the  
2 transition.

3  
4 A more complex approach permits more sophisticated  
5 interactions. In this approach, a computer-generated character is  
6 animated based on an actor's rendition of the same word. The  
7 actor says a word with certain markers on his face, capturing the  
8 main articulation points. The articulation points are then mapped  
9 onto corresponding points for the cartoon character, allowing the  
10 character's animation to mimic the actor's expression. Again,  
11 simple morphing can be used to deal with the inter-word  
12 transitions. See, for example, F. Pighin, J. Hecker, D.  
13 Lischinski, R. Szeliski, and D. Salesin, "Synthesizing Realistic  
14 Facial Expressions from Photographs", *Proceedings of Siggraph*  
15 (1998), and M. Brand, "Voice Puppetry", *Proceedings of Siggraph*  
16 '99 (1999). In addition, basic emotional affect and other  
17 interactive changes to the facial animation can be incorporated.  
18 For example, the eyes of an animated character can follow the  
19 customer using feedback from the video camera 26. See Gustafson  
20 et al. (1999) and Pighin et al. (1998).

21  
22 In addition, the CIT 12 may prompt the customer via computer-  
23 generated voice or displayed text to add other items to the menu  
24 list, and a complete order may require multiple interactions  
25 between the customer and virtual cashier 38; i.e., after the



1 by verbal request), a network connection is created at 112 between  
2 the CIT 12 (and computer system 14) and the call center 16. The  
3 network connection may be a high speed voice over internet  
4 protocol (VoIP) connection permitting the transmission of the  
5 customer's voice order quickly and inexpensively to an operator 40  
6 at the off-site call center 16. Additionally or alternatively,  
7 the connection may be a high speed data connection, and the  
8 customer's recorded verbal order is sent from the memory of the  
9 computer system 14 to the audio speaker 42 directed at the  
10 operator 40. The operator 40 is able to correct, verify or  
11 complete the customer menu orders at 114. As the operator makes  
12 the required changes or additions, the CIT is updated at 116 to  
13 indicate the changes and additions and provide feedback to the  
14 customer. Whether the AI routines or an operator is interacting  
15 with the customer, according to the preferred embodiment of the  
16 invention, it is desirable that the customer receive the same  
17 manner of interaction so that the customer is unaware when an  
18 operator 40 has intervened. As such, instructions by the operator  
19 40 to the CIT 12, at 116, preferably result in the same type of  
20 CIT updating (text, speech, and animation) as when the AI routines  
21 alone interface with the customer and, until the order is complete  
22 at 118, the customer continues his or her food order by speaking  
23 to and otherwise interacting with the virtual cashier 38 on the  
24 CIT at 120. The operator preferably interacts with the CIT and  
25 the customer by inputting keyboard commands, mouse, or voice

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1 commands which cause a preprogrammed automated update responses at  
2 the CIT. If the operator needs to respond outside the capability  
3 of the preprogrammed responses, the operator preferably speaks  
4 into the microphone 44 and the speech is converted to text by  
5 voice recognition. The recognized speech is filtered to remove  
6 unwanted accents and words and to provide smoothing, and data  
7 corresponding to the speech is sent to the computer and then  
8 synthesized by the CIT or used to trigger recorded words in memory  
9 of the CIT. According to the first embodiment of the invention,  
10 once the connection is made with the call center at 112, the  
11 operator 40 is utilized to complete the order with the customer  
12 without reversion to the AI routines.

13  
14 Once the order is complete at 118, the customer is prompted  
15 at 122 for payment which is preferably made at the CIT. Payment  
16 is made at 124 using a debit card or credit card in conjunction  
17 with the card reader 30, or with cash in conjunction with the bill  
18 reader 32 and change dispenser 34. After payment is made, the CIT  
19 prints at 126 with the printer 28 a receipt for the customer  
20 indicating the details of the order as well as an order number,  
21 and the virtual cashier directs the customer to proceed to an  
22 order pick-up area. In conjunction with order payment and receipt  
23 printout, the order is sent at 128 to order fulfillment employees  
24 (kitchen staff and order assembly personnel) who prepare the  
25 order. The orders are packaged with the respective order number

1 and, once complete, the customer is provided at 130 with the  
2 customer's corresponding order.

3  
4 Turning now to Figs. 1 and 3, a flow chart for a second  
5 preferred embodiment of the invention is shown. The second  
6 embodiment is substantially similar to the first embodiment, with  
7 the following differences. A CIT greeting is provided at 200  
8 which, rather than prompts the customer to place an immediate  
9 order (as in the first embodiment), requests whether the customer  
10 would like to place an order, e.g., "Hello, would you like to  
11 place an order." This request is intended to cause an initial  
12 "Yes" response or other CIT-customer interaction from the  
13 customer, at 202, prior to order placement and provide a short  
14 delay prior to order entry which is sufficient for establishment  
15 at 204 of a connection to the call center 16. Alternatively, the  
16 connection may be made upon indication by a sensor 37 which senses  
17 the presence of customer ready to place an order. As yet another  
18 alternative, a constant connection may be maintained between the  
19 CIT 12 and the call center 16 and the CIT greeting may be intended  
20 to cause immediate order placement by the customer.

21  
22 In either approach, the customer then interacts at 206 with  
23 the CIT 12 in real-time, verbally ordering food. The AI routines  
24 in the computer process the interaction at 208 to parse and  
25 identify the elements the food order. Assuming there is no

1 problem with the processing at 210, after each menu item is  
2 ordered, the CIT is updated at 212, and the AI routines continue  
3 to process the order until the order is complete at 214. However,  
4 if there is a problem at 210 during any of the AI processing, the  
5 order is assigned to an operator 40 at the call center 16, and the  
6 operator corrects the order at 216, and the CIT is then updated at  
7 212. According to the second embodiment of the invention, if the  
8 customer order is incomplete at 214, the AI routines are again  
9 given responsibility at 208 for processing the interaction between  
10 the customer and CIT at 206 and maintains control absent another  
11 processing problem at 208. This is in contrast to the first  
12 embodiment, where after the occurrence of a processing problem an  
13 operator is given responsibility for not only correcting the  
14 problem but completing the order.

15  
16 Once the order is complete at 214, the steps of prompting the  
17 customer for payment through providing the customer with the order  
18 (that is, steps 222-230) are the same as the analogous steps in  
19 the first embodiment (steps 122-130).

20  
21 While the above described transaction processing system is  
22 optimized for use within a fixed location, such as the order  
23 processing space of a fast food restaurant, it will be appreciated  
24 that the CIT may be optimized for drive-through use and adapted to  
25 be handed to the customer or taken from a station at the beginning

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1 more reliable. One exemplar all audio-based CIT eliminates the  
2 speaker and preferably includes written instructions directing the  
3 customer to tune a car radio to a particular frequency. The CIT  
4 then broadcasts the virtual cashier's voice into the car through  
5 the car's radio and speaker system. This may be done by adapting  
6 the CIT such that when it is placed near the car radio, it  
7 automatically sends the audio signal over the car's radio system.  
8 Transmission of audio signals through the radio in this manner is  
9 known for common audio devices such as MP3 players. In addition,  
10 rather than include a microphone, the words spoken by the customer  
11 are received by means of a laser incident on the windshield or  
12 driver side window of the car. The laser detects the vibration of  
13 the glass caused by the customer's spoken words and then reconvert  
14 this vibration signal back into an audio signal. This technology,  
15 developed for espionage purposes, is now widely available. The  
16 advantage of this approach is that it minimizes the need for extra  
17 hardware to be produced and then put at risk by placing it into  
18 the hands of the customer where it potentially may be damaged or  
19 stolen.

21        If multiple CITs are distributed to drive-through customers,  
22        it is preferable that each is linked to a central server in the  
23        restaurant by wireless networking technology, e.g., such as the  
24        Bluetooth™ standard. In addition, it is preferred that the  
25        portable CITs be used in conjunction with a system which prevents



1 or inhibits accidental or purposeful removal of the CIT from the  
2 restaurant property. As such, when the unit is removed from the  
3 restaurant property, the unit is preferably adapted to make an  
4 alarm sound and warn the customer to return the CIT unit. The  
5 restaurant staff is likewise alerted and a digital or film  
6 photograph is preferably taken of the car (including the license  
7 plate) to aid in law enforcement action recovery. The portable  
8 CIT preferably informs the customer that a picture has been taken  
9 of their car and instructs the customer to return the unit to the  
10 restaurant. The CIT may also send out a tracking signal, e.g.,  
11 GPS coordinates, permitting the CIT to be located.

12  
13 It will be recognized that the above described systems and  
14 methods eliminate the need and space required for traditional  
15 human cashiers and, therefore, provide a greater amount of the  
16 order processing space for CITs. Furthermore, as the CITs  
17 preferably display a face and provide a spoken dialogue with the  
18 customer, the customer does not require any particular training to  
19 use the system; i.e., use of the system of the invention provides  
20 a substantially seamless experience, in terms of ordering, from  
21 conventional fast food ordering experiences. The customer  
22 interacts in the same manner as he or she has previously with  
23 human cashiers. Moreover, the system, while easy to use for the  
24 customer, provides substantial novelty which attracts and retains  
25 customers.

1       There have been described and illustrated herein several  
2       embodiments of a point-of-sale commercial transaction processing  
3       system, and one particularly suited for use in a fast food  
4       restaurant. While particular embodiments of the invention have  
5       been described, it is not intended that the invention be limited  
6       thereto, as it is intended that the invention be as broad in scope  
7       as the art will allow and that the specification be read likewise.  
8       Thus, while particular elements of the CIT have been disclosed, it  
9       will be appreciated that other elements may be included or  
10      removed, provided that the CIT is capable of permitting verbal  
11      input from the customer which can then be at least partially  
12      processed by AI routines in a computer. Furthermore, while in the  
13      first embodiment, the operator once given control of a portion of  
14      a customer order retains control of the order, it will be  
15      appreciated that the system can be operated permit the AI routines  
16      to regain control of an order. In addition, while particular  
17      orders of the method of the invention have been shown and  
18      described with respect to the flow charts, it will be appreciated  
19      that another order may be used, and that the two flow charts are  
20      exemplary. Also, while the transaction processing system has been  
21      described with respect to the operations of a fast food  
22      restaurant, it will be appreciated that the system may be used in  
23      other industries which have conventionally used a point-of-sale  
24      register. By way of example, and not by way of limitation, the  
25      system is suitable for use in the rental car industry and the

1 purchase of movie/theater tickets. Furthermore, while the display  
2 is shown with a virtual cashier and details of an order, it will  
3 be appreciated that the display can display advertising (of the  
4 establishment in which it is being used, or of another  
5 establishment, and promotions of the establishment). Such  
6 displays of advertising and promotions can occur during an order  
7 transaction or while the CIT is idle waiting for a customer to  
8 interact with the CIT. It will therefore be appreciated by those  
9 skilled in the art that yet other modifications could be made to  
10 the provided invention without deviating from its spirit and scope  
11 as claimed.

## Claims:

1. A point-of-sale commercial transaction processing system for processing a customer transaction based upon a verbal instruction from the customer, comprising:

a) a first customer interaction terminal (CIT) adapted to receive the verbal instructions from a customer and convert the verbal instruction into an audio signal;

b) a first computer system in communication with said first CIT and including an artificial intelligence (AI) system which receives said audio signal and processes said audio signal to at least partially recognize the verbal instruction from the customer; and

c) a human-controlled response system in communication with said first computer system and adapted intervene to interact with the customer when said AI system has not satisfactorily recognized the verbal instruction from the customer.

2. A transaction processing system according to claim 1, wherein:

said first CIT includes a microphone which receives the verbal instruction.

- |   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 3 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 4 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 5 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |

9. A transaction processing system according to claim 1, wherein:  
said first CIT includes a payment system.
10. A transaction processing system according to claim 9, wherein:  
said payment system includes at least one of a debit card reader, a credit card reader, and a currency reader.
11. A transaction processing system according to claim 1, wherein:  
said first CIT includes a printer.
12. A transaction processing system according to claim 1, wherein:  
said first CIT includes a video camera.
13. A transaction processing system according to claim 1, wherein:  
said first computer system is integral with said first CIT.
14. A transaction processing system according to claim 1, wherein:  
said first computer system is adapted to respond to the verbal instruction.
15. A transaction processing system according to claim 1, wherein:  
the verbal instruction pertains to a restaurant food order.

16. A transaction processing system according to claim 1, wherein:  
said first CIT is in wireless communication with said first computer system.

17. A transaction processing system according to claim 1, wherein:  
said human-controlled response system is off-premises relative to said first CIT and said first computer system.

18. A transaction processing system according to claim 1, further comprising:

d) a second CIT in communication with said first computer system.

19. A transaction processing system according to claim 1, further comprising:

d) a second computer system in communication with said response system; and

e) at least one CIT in communication with said second computer system.

20. A method of processing a commercial transaction, comprising:

- a) providing an interactive terminal;
- b) eliciting a verbal instruction from a customer to the interactive terminal;
- c) upon verbal instruction from the customer to the interactive terminal, processing the verbal instruction with artificial intelligence (AI) routines; and
- d) upon determining a problem in said processing, having a human intervene to process the verbal instruction.

21. A method according to claim 20, wherein:

said interactive terminal is adapted to elicit a restaurant food order.

22. A method according to claim 20, further comprising:

e) providing feedback to the customer after the verbal instruction is processed by one of the AI routines and the human.

23. A method according to claim 22, wherein:

said feedback includes at least one of audio feedback and video feedback.

24. A method according to claim 22, wherein:

said feedback is controlled by AI routines.



26. A method according to claim 22, wherein:

said verbal instruction is the order of a restaurant menu item, and said feedback includes at least one of,

ii) prompting the customer to increase the size of the menu order.

repeating b), c), and d) until a customer has no additional verbal instructions for the transaction.

e) collecting payment from the customer via the terminal.

the human is located off-premises relative to said interactive terminal.

said human receives the verbal instruction over a voice over internet protocol (VoIP) network connection.

## ABSTRACT OF THE DISCLOSURE

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1 A point-of-sale commercial transaction processing system,  
2 particularly suitable for the fast food industry, is provided.  
3 The transaction processing system utilizes (1) a customer  
4 interaction terminal (CIT) having a video display, an audio  
5 speaker, a microphone, and preferably a printer, (2) a computer  
6 system in communication with the customer interaction terminal  
7 (CIT) and running artificial intelligence routines to process or  
8 pre-process verbal requests provided into the microphone of the  
9 customer interaction terminal, and (3) a human-controlled response  
10 system in communication with the computer system which completes,  
11 corrects or verifies requests that cannot be satisfactorily  
12 completed by the artificial intelligence routines alone. The  
13 human-controlled response system is preferably in communication  
14 with the customer interaction terminal (CIT) and the customer via  
15 a high speed network connection.  
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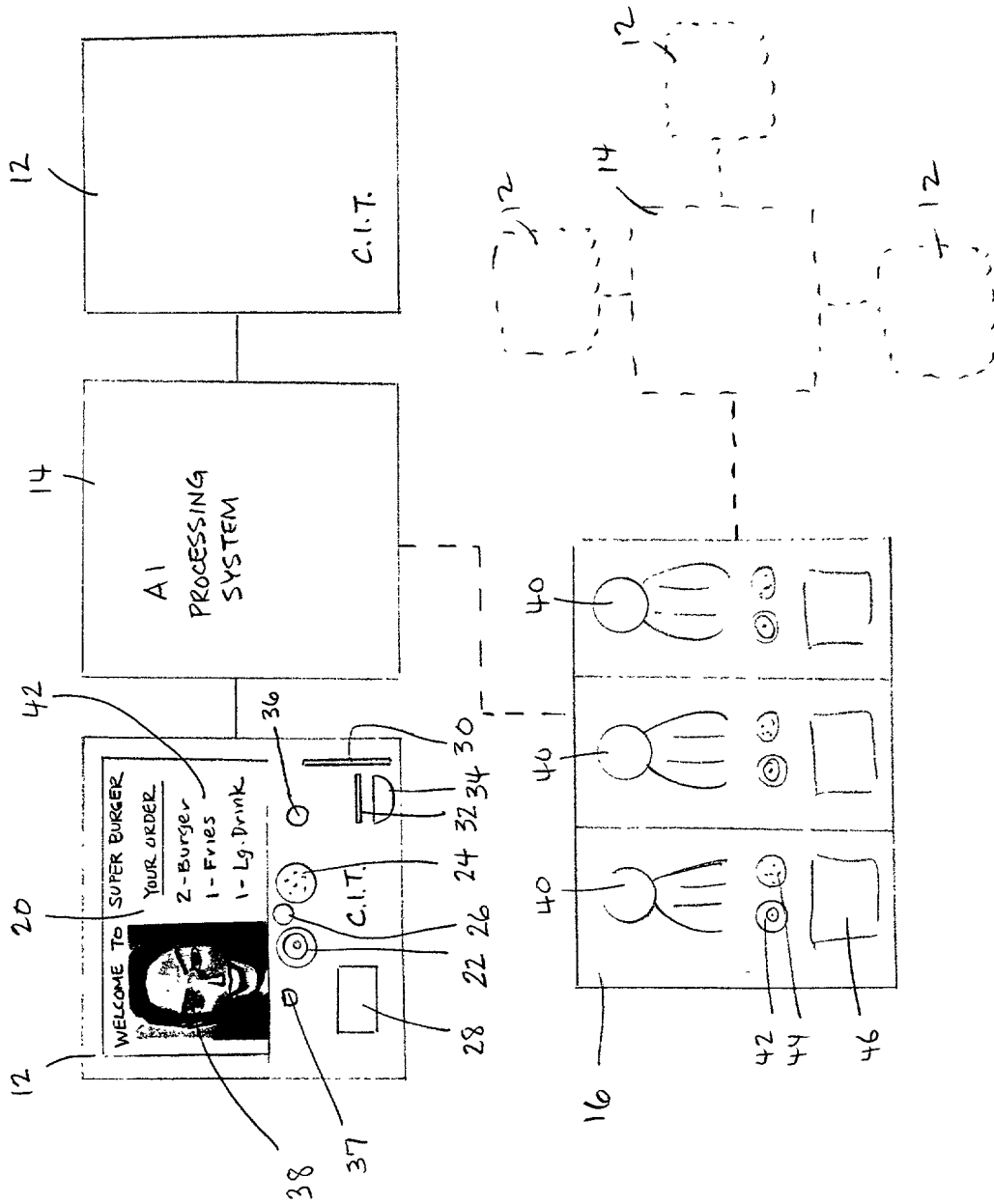


FIG. 1

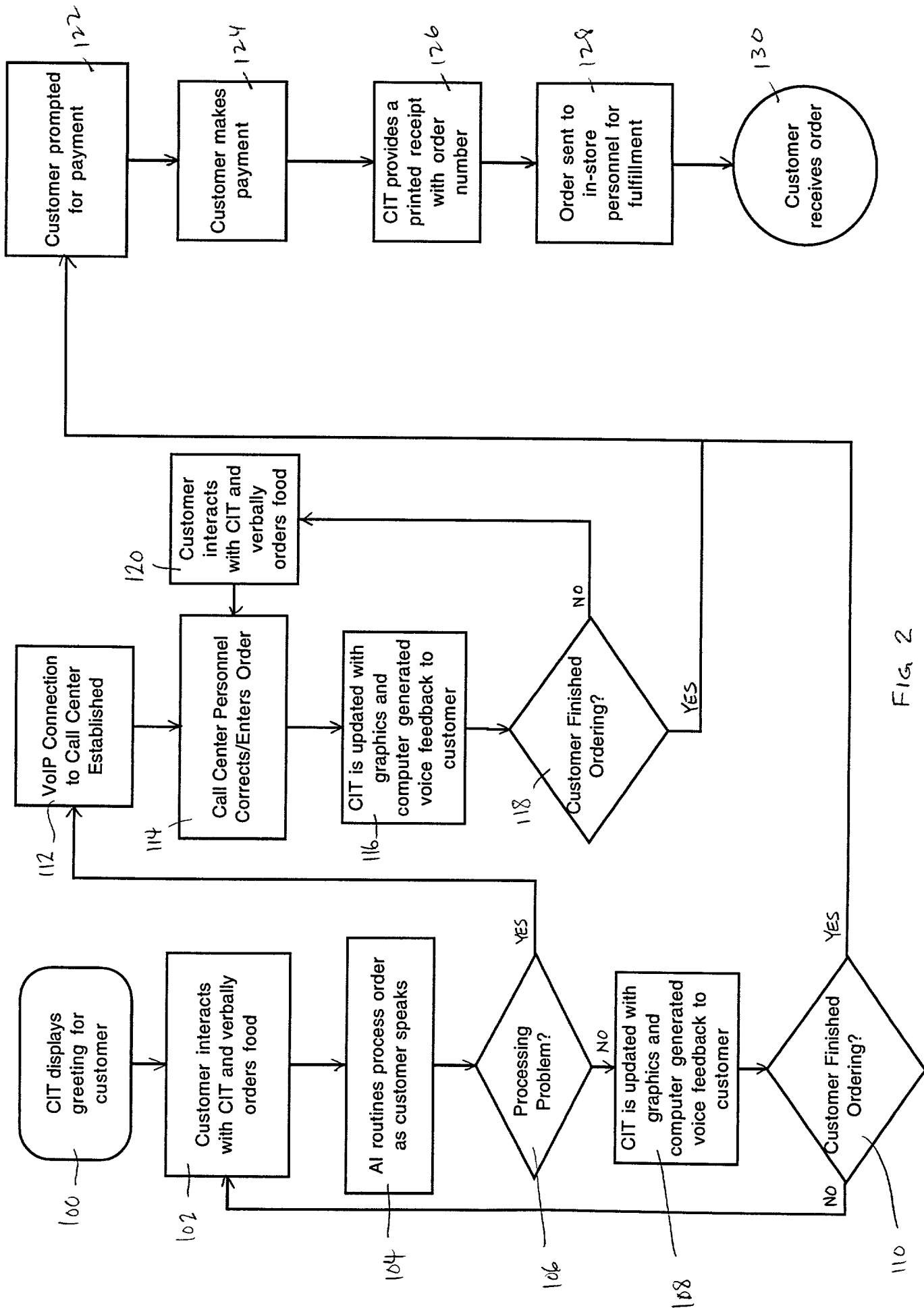


FIG. 2



Docket No. **AAI-002****DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY**

As below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name, and

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed for and for which a patent is sought on the invention entitled

**A POINT-OF-SALE COMMERCIAL TRANSACTION PROCESSING SYSTEM USING ARTIFICIAL INTELLIGENCE ASSISTED BY HUMAN INTERVENTION**, the specification of which

☒ [X] is attached hereto.

☐ [ ] was filed on \_\_\_\_\_

as application Serial Number \_\_\_\_\_

and was amended on (if applicable) \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I verify that I am qualified as an independent inventor under Title 37, Code of Federal Regulations, Section 1.9(c), and my obligation to assign rights to this invention, if any, is to a qualified small business concern under Title 37, Code of Federal Regulations, Section 1.9(d).

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Claimed

_____ (Number)	_____ (Country)	____/____/____ D/M/YR FILED	<input type="checkbox"/> [ ] YES	<input type="checkbox"/> [ ] NO
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_____ (Number)	_____ (Country)	____/____/____ D/M/YR FILED	<input type="checkbox"/> [ ] YES	<input type="checkbox"/> [ ] NO
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I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I

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acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Ser. No) (Filing Date) (Status-Patented,pending,abandoned)

(Application Ser. No) (Filing Date) (Status-Patented,pending,abandoned)

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

David P. Gordon (29,996), David S. Jacobson (39,235), Thomas A. Gallagher (31,358)

Address all telephone calls to David P. Gordon at (203) 329-1160  
Address all correspondence to David P. Gordon, Esq.  
65 Woods End Road  
Stamford, Connecticut 06905  
U.S.A.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**SOLE OR FIRST INVENTOR**

Signature \_\_\_\_\_ Date \_\_\_\_\_

Full Name Kevin E. Mahaffy

Residence 897 East Country View Circle, Fresno, CA 93720

Citizenship US

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**SECOND INVENTOR**

Signature David B. Mahaffy Date 9/7/00

Full Name David B. Mahaffy

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Citizenship US

P.O. Address Same as address

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Docket No. AAI-002**DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY**

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☒ [X] is attached hereto.

☐ [ ] was filed on \_\_\_\_\_  
as application Serial Number \_\_\_\_\_  
and was amended on (if applicable) \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I verify that I am qualified as an independent inventor under Title 37, Code of Federal Regulations, Section 1.9(c), and my obligation to assign rights to this invention, if any, is to a qualified small business concern under Title 37, Code of Federal Regulations, Section 1.9(d).

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Claimed

_____ (Number)	_____ (Country)	____/____/____ D/M/YR FILED	<input type="checkbox"/> [ ] YES	<input type="checkbox"/> [ ] NO
_____ (Number)	_____ (Country)	____/____/____ D/M/YR FILED	<input type="checkbox"/> [ ] YES	<input type="checkbox"/> [ ] NO

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I

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acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Ser. No) (Filing Date) (Status-Patented,pending,abandoned)

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**SOLE OR FIRST INVENTOR**

Signature Kevin E. Mahaffy Date 6 SEP 2000

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P.O. Address Same as address

**SECOND INVENTOR**

Signature \_\_\_\_\_ Date \_\_\_\_\_

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**THIRD INVENTOR**

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